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where $\psi(x)$ must be supposed less than unity, in order that the following transformation may hold :—

$$\frac{1}{\Gamma\sqrt[m]{\psi(x)}}=\frac{\sin\pi\sqrt[m]{\psi(x)}}{\pi}\Gamma(1-\sqrt[m]{\psi x})$$

$$\sin\pi\sqrt[m]{\psi(x)}=\frac{1}{2\pi}\int_0^\pi\frac{d\theta(1-\sqrt[m]{\psi(x)^2})d\theta(\sin\pi\epsilon^{i\theta}+\sin\pi\epsilon^{-i\theta})}{1-2\cos\theta\sqrt[m]{\psi(x)}+\sqrt[m]{\psi(x)^2}}$$

$$=\frac{1}{2\pi}\int_0^\pi\frac{d\theta(1-\sqrt[m]{\psi(x)^2})\mathrm{F}(\psi x\,\epsilon^{i\theta})\mathrm{F}(\psi(x),\epsilon^{-i\theta})\,(\sin\pi\epsilon^{i\theta}+\sin\pi\epsilon^{-i\theta})}{1-2\cos m\theta,\ \psi(x)+\psi(x)^2},$$

where

$$\mathrm{F}(\psi(x),\epsilon^{i\theta})\ =\psi(x)^{\frac{m-1}{m}}+\epsilon^{i\theta}\psi(x)^{\frac{m-2}{m}}+\ldots.,$$

$$\mathrm{F}(\psi(x),\epsilon^{-i\theta})=\psi(x)^{\frac{m-1}{m}}+\epsilon^{-i\theta}\psi(x)^{\frac{m-2}{m}}+\ldots.;$$

also

$$\Gamma(1-\sqrt[m]{\psi(x)}=\int_0^\infty\epsilon^{-v}v^{-\sqrt[m]{(\psi x)}}dv.$$

The remainder of the process will be evident from the two former examples.

V. "On a Theorem concerning Discriminants." By J. J. Sylvester, F.R.S. Received May 27, 1865.

Let $\mathrm{F}(a, b, c, d)=a^2d^2+4a^3c+4d^3b-3a^2b^2-6abcd$, and let a, b, c, d be four quantities all greater than zero, which make this function vanish.

(1) The cubic equation in x, $\mathrm{F}(a, x, c, d)$ will have two positive roots (b, b_1); so $\mathrm{F}(a, b_1, x, d)$ will have two such roots (c, c_1), $\mathrm{F}(a, x, c_1, d)$ two such (b_1, b_2), $\mathrm{F}(a, b_2, x, d)$ two such (c_1, c_2), and so on *ad infinitum*; we may thus generate the infinite series $b_1\,c_1\,b_2\,c_2\ldots\ldots\ldots$

Similarly, beginning with the equation $\mathrm{F}(a, b, x, d)$, and proceeding as above, we shall obtain a similar series, $c', b', c'', b''\ldots$; and combining the two together, and with the initial quantities b, c, we obtain a series proceeding to infinity in both directions $\ldots\ldots b''\,c''\,b'\,c'\,b\,c\,b_1\,c_1\,b_2\,c_2\ldots\ldots$

(2) The four quantities

$$\frac{\delta\mathrm{F}}{\delta a},\ \frac{\delta\mathrm{F}}{\delta b},\ \frac{\delta\mathrm{F}}{\delta c},\ \frac{\delta\mathrm{F}}{\delta d},$$

where F represents $\mathrm{F}(a, b, c, d)$, will present one or the other of the three following successions of sign,

$$\begin{matrix}+ & - & + & -\\ - & + & - & +\\ 0 & 0 & 0 & 0\end{matrix}$$

(3) When the last is the case, *i.e.* when the differential derivatives all

vanish, the quantities b, c remain stationary in the above double infinite series; in the two other cases, the b quantities and c quantities *continually* increase in one direction and *continually* decrease in the other, the increase taking place in that direction in which we must read the successions of sign of the derivatives of F so as to begin with passing from plus to minus.

(4) To the increase of b and c there is no limit, but to the decrease of each there is a limit, viz. $a^{\frac{2}{3}}\ d^{\frac{1}{3}}$ and $a^{\frac{1}{3}}\ d^{\frac{2}{3}}$ are the limits towards which the b and the c terms respectively converge.

I conclude with remarking that the above theorem is only a particular illustration, and the most simple that can be given, of a very wide theory relating to discriminants of all orders which springs as an immediate consequence from the principles involved in the theory of variation of algebraical forms referred to in the note which I had recently the honour of laying before the Society.

VI. "Some Observations on Birds, chiefly in relation to their Temperature, with Supplementary Additions." By JOHN DAVY, M.D. F.R.S., &c. Received May 26, 1865.

(Abstract.)

This paper consists of four parts:

In part first the author gives the results of his observations on the temperature of the common fowl (as many as sixty-two), made at different seasons of the year, showing that the temperature of this bird ranges from 107° to 109° Fahr. *in recto*; that that of the male is a little higher than that of the female, and of both, higher in summer than in winter.

He states that he was induced to pay so much attention to the temperature of the common fowl, from Mr. Hunter having assigned it a temperature no higher than between 103° and 104°, a degree reached by some of the mammalia, and even exceeded.

The second part contains the results of the author's experiments on the air expired by a certain number of birds, and on the air contained in their air-receptacles and bones. They are introduced with some observations on the length of time birds are capable of retaining life under water, from which it appears that it differs greatly in different species, varying from ten minutes, as in the instance of the duck, to half a minute, as in the instance of the owl.

From the analysis of the air expired in the act of drowning, it would appear that there is a certain loss of carbonic acid, equivalent to the proportion of oxygen less than exists in the atmospheric air expired,—a loss, it is inferred, owing to absorption by the blood of the gas which has disappeared, as indeed is indicated by the darkness of colour of this fluid, and confirmed by the effects of exhaustion by the air-pump.

A deficiency, too, of carbonic acid was found in the air of the air-recep-